

In the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

1. (original) A multi-frequency antenna with a first operational frequency and a second operational frequency for a portable electronic device, the multi-frequency antenna comprising:
an antenna body including a feed-in terminal, a ground terminal, a first radiation arm, and a second radiation arm, wherein the first and second radiation arms are arranged in symmetrically inward spiral form, share the feed-in terminal, and form a first current path and a second current path which realize the first and second operational frequencies respectively; and
a ground plane, coupled to the ground terminal and disposed with respect to the antenna body.

2. (original) The multi-frequency antenna according to claim 1, wherein the ground plane has a hollowed section which is beneath the endfire direction of the antenna.

3. (original) The multi-frequency antenna according to claim 2, wherein the first operational frequency belongs to GSM bandwidth, and the second operational frequency belongs to DCS bandwidth.

4. (original) The multi-frequency antenna according to claim 1, wherein the first operational frequency belongs to GSM bandwidth, and the second operational frequency belongs to DCS bandwidth.

5. (original) A portable electronic device with a first operational frequency, a second operational frequency, and a third operational frequency, the portable electronic device comprising:

a multi-frequency antenna, comprising:

an antenna body including a feed-in terminal, a ground terminal, a first radiation arm, and a second radiation arm, wherein the first and second radiation arms are arranged in symmetrically inward spiral form, share the feed-in terminal, and form a first current path and a second current path which realize the first and second operational frequencies respectively; and a ground plane, coupled to the ground terminal and disposed with respect to the antenna body;

and

a patch antenna, separately disposed in a side of the multi-frequency antenna, having a third current path to realize the third operational frequency.

6. (original) The portable electronic device according to claim 5, wherein the ground plane has a hollowed section which is beneath the endfire direction of the antenna.

7. (original) The portable electronic device according to claim 6, the first operational frequency belongs to GSM bandwidth, the second operational frequency belongs to DCS bandwidth, and the third operational frequency is 2.45 GHz.

8. (original) The portable electronic device according to claim 5, wherein the antenna body and the patch antenna are disposed at a distance of about 1 to 7 mm in order to be coupled to PCS bandwidth.

9. (original) The portable electronic device according to claim 8, wherein the first current path has a length which sets the first operational frequency within GSM bandwidth, the second current path has a length which sets the second operational frequency within PCS bandwidth.

10. (cancelled)

11. (original) The portable electronic device according to claim 5, wherein the first current path sets the first operational frequency within GSM bandwidth, and the second current path sets the second operational frequency within DCS bandwidth.

12-13. (cancelled)

14. (previously presented) A portable electronic device with a first operational frequency, a second operational frequency, and a third operational frequency, the portable electronic device comprising:

a multi-frequency antenna, comprising:

an antenna body including a feed-in terminal, a ground terminal, a first radiation arm, and a second radiation arm, wherein the first and second radiation arms are arranged in

symmetrically inward spiral form, share the feed-in terminal, and form a first current path and a second current path which realize the first and second operational frequencies respectively; and
a ground plane, coupled to the ground terminal and disposed with respect to the antenna body;
and
a patch antenna, separately disposed in a side of the multi-frequency antenna, having a third current path to realize the third operational frequency, wherein the third current path sets the third operational frequency meeting the requirement of Bluetooth communication.

15. (previously presented) The portable electronic device according to claim 14, wherein the antenna body and the patch antenna are disposed at a distance of about 1 to 7 mm in order to be coupled to PCS bandwidth.

16. (previously presented) The portable electronic device according to claim 14, wherein the first operational frequency belongs to GSM bandwidth, the second operational frequency belongs to DCS bandwidth, and the third operational frequency is 2.45 GHz.

17. (previously presented) A multi-frequency antenna with a first operational frequency and a second operational frequency, the multi-frequency antenna comprising:
an antenna body including:

a ground terminal;
a first radiation arm and a second radiation arm, wherein the first and second radiation arms are arranged symmetrically, each wind inward and around respective

central points, share the feed-in terminal, and have a first open end and a second open end respectively; and

a feed-in terminal, located on one side of the first and second arms so that a first current path and a second current path, different in length, are respectively created along the first and second radiation arms from the feed-in terminal to the first and second open ends, and realize the first and second operational frequencies, respectively; and
a ground plane, coupled to the ground terminal and disposed with respect to the antenna

body.